Simulated eye clinic and virtual eye case: alternative worlds for medical students

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Ophthalmology teaching in our medical school traditionally consists of a 2-week attachment in third year, but an apparent decline in ophthalmic knowledge and skills following this, has been observed. Two novel teaching interventions were introduced in fifth year. A simulated eye clinic (SEC) was run for all final year students. The SEC consisted of four cubicles with four simulated patients (SPs) playing the role of patients with temporal arteritis; an acute oculomotor nerve palsy; a pituitary tumour and sudden loss of vision in 'only eye' in a patient who had just bought a new car. These were chosen as important cases that could present to non-ophthalmic doctors. Students worked in teams of five, had 15 min per station and rotated around all stations. Each of the five students in each team was given a defined role at each station: one called the patient from the waiting room and took a history, one measured the best corrected visual acuity (BCVA), one performed the relevant ophthalmic examination and one made a differential diagnosis, management plan and referral. Referrals were made by students making a phone call answered live by tutors, who sat in another room acting the role of whoever it was that the students had chosen to call. The fifth student was the 'pseudoexaminer', who was given a 'mark sheet' and asked to comment on her peers'

performances at the end of each station. One of the four stations was the 'on-call station' at which the team, in addition to managing the case, had to field three incoming calls and give advice over the phone: an ocular chemical injury, a painful red eye and new onset floaters. At the end, the tutors, students and SPs all gathered for a 20 min debriefing and discussion.

Self-reported confidence (SRC) in ophthalmic skills was measured in third and fifth years. Ethical committee approval was granted. A power calculation was performed prior to recruitment. There were two groups of participants: group 1 consisted of third year students who completed an SRC questionnaire at the start (n=95) and end (n=45) of their ophthalmology attachment, and group 2 consisted of fifth year students who completed the same questionnaire at the start (n=95) and end (n=96) of the SEC. The age range, gender balance and declared ophthalmic experience prior to medical school were similar across groups.

There was a significant increase in mean cumulative SRC from the start to the end of the standard third year ophthalmology attachment (Wilcoxon signed-rank test, standardised test statistic=10.2, p<0.001), and a decline in SRC from the end of the third year attachment to the start of the SEC (16–24 months later; Mann-Whitney U=368.0,

Table 1 Absolute SRC levels (recorded on an ordinal scale from 1 to 6) for each skill and stage

Skill	Stage	Mean SRC* (SD)	Wilcoxon significance test result	Mann-Whitney significance test result
BCVA testing	Start of third year attachment	3.8 (0.9)	p<0.001	
	End of third year attachment	5.4 (0.7)	Z=−6.0	p<0.001
	Start of fifth year SEC	4.3 (1.0)	p<0.001	(U=726.5)
	End of fifth year SEC	4.6 (0.8)	Z=−7.2	
Direct ophthalmoscopy	Start of third year attachment	3.2 (1.0)	p<0.001	
	End of third year attachment	4.7 (0.9)	Z=−5.7	p<0.001
	Start of fifth year SEC	3.5 (1.2)	p<0.001	(U=868.5)
	End of fifth year SEC	4.6 (0.8)	Z=−7.0	
Pupillary examination	Start of third year attachment	4.3 (1.0)	p<0.001	
	End of third year attachment	5.7 (0.5)	Z=−5.9	p<0.001
	Start of fifth year SEC	4.4 (0.9)	p<0.001	U=511.0
	End of fifth year SEC	5.2 (0.7)	Z=−7.1	
Visual field examination	Start of third year attachment	3.8 (1.1)	p<0.001	
	End of third year attachment	5.5 (0.7)	Z=−5.9	p<0.001
	Start of fifth year SEC	4.2 (1.0)	p<0.001	U=638.5
	End of fifth year SEC	5.1 (0.8)	Z=−7.7	
Extraocular movement examination	Start of third year attachment	4.3 (1.1)	p<0.001	
	End of third year attachment	5.6 (0.6)	Z=−5.8	p<0.001
	Start of fifth year SEC	4.6 (1.1)	p<0.001	U=817.0
	End of fifth year SEC	5.2 (0.7)	Z=−6.9	

*Key: 1=no confidence, 2=very low confidence; 3=low confidence; 4=some confidence; 5=moderate confidence; 6=very confident.
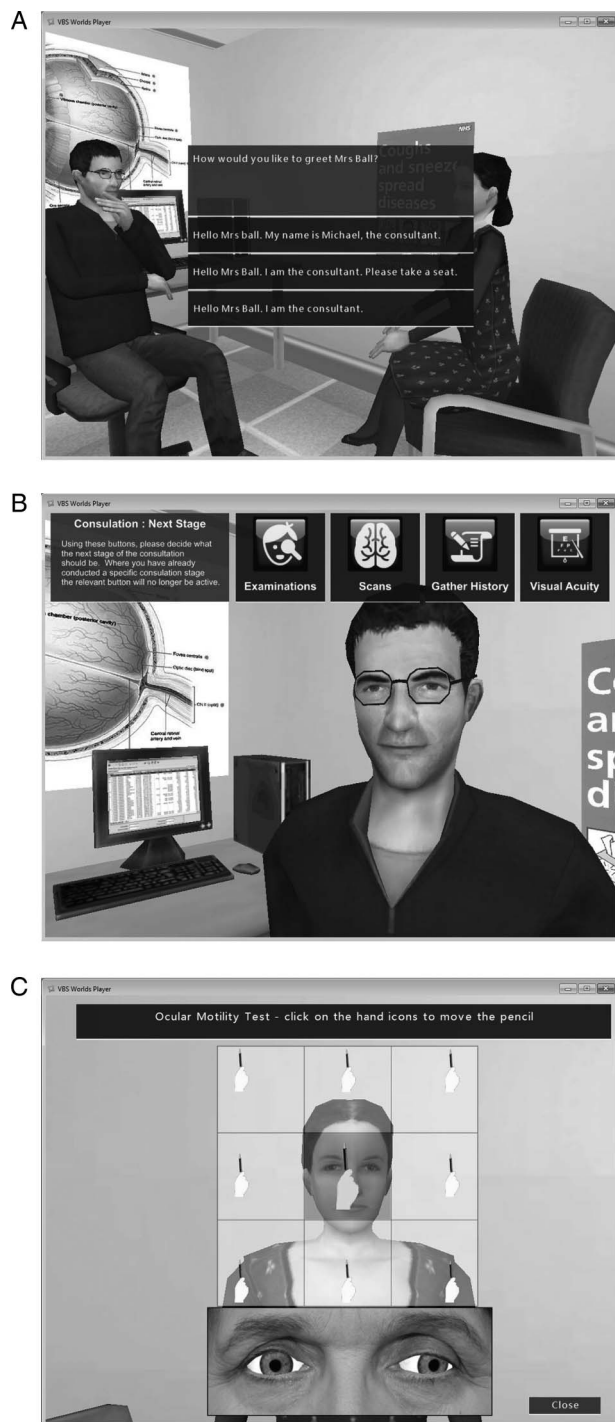BCVA, best corrected visual acuity; SEC, simulated eye clinic; SRC, self-reported confidence.

Figure 1 Screenshots from the virtual eye clinic. (A) The consultation. (B) Home screen. (C) Extraocular movement testing.

p<0.001). However, the single afternoon of the SEC was associated with an increase in SRC (Wilcoxon signed-rank test, standardised test statistic=12.0, p<0.001). There was no significant difference between the cumulative SRC scores at the end of the third year attachment compared with the end of the fifth year SEC (Mann-Whitney U=1445, p=0.001). SRC scores for *each* skill are shown in table 1. There were 13 ratings of 'no confidence' across all skills at the start of third year, while none at the end. There were eight ratings across all skills of 'no confidence' at the start of the SEC but none at the end. At the end of both the third years' and the fifth years' attachments, the

median ratings for each skill were 'moderate confidence' or 'very confident'.

A year later a PC-based virtual eye clinic (VEC) replaced the third nerve palsy station (figure 1A–C). This was created using a three-dimensional (3D) gaming engine to emulate an ophthalmic consultation, developed by MW and technologyprojects-management.com. Students were presented with a 3D world and asked to gather the history and make decisions on investigation and management, using drop down menus, their decisions driving branching within the simulation. They also could conduct simulated examinations of visual fields to confrontation and eye movements. Exemplar quotations from students with reference to the VEC included comments that the advantages of a virtual case were that 'it was fun and interactive', and that 'you could work at your own pace'. It 'stimulates a real time sensed hospital experience', but it was 'quite slow with no audio', and would be 'more useful for home studying'. 'More cases would be great!'

A future study should examine the extent to which the downward trajectory of SRC continues following the SEC. Furthermore, it is unknown whether alternative refresher courses than the SEC would be as effective for most students. An unexpected learning need observed during the SEC was students' lack of familiarity with calling a patient from the waiting room and assessing the patient from the first contact, for example noticing, or not, the SP acting out a bitemporal hemianopia *en route* to the cubicle.

It is unclear how closely, or not, SRC in ophthalmology correlates with actual competence. However, while self-assessment measures have been used as measures of the impact of educational interventions in many studies,[1] a concern is that self-assessment is more complex than can be captured in a questionnaire.[2]

The SEC was designed to allow students to explore the words patients use to describe visual symptoms, practice measuring and describing BCVA accurately, reactivate ophthalmic clinical skills and to rehearse non-technical skills such as team work, communication and decision-making in a safe environment. Our experience indicates it was feasible, and the data collected suggest it was effective with regard to SRC. The VEC also worked in practical terms, complemented the simulated cases, but may be more appropriately used in a different setting. High-quality evidence of the non-inferiority of the VEC compared with other means of learning is needed.

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